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ROSAT HRI and ASCA Observations of the Spiral Galaxy NGC 6946 and Its Northeast Complex of Luminous SNRs Eric M. Schlegel<sup>1</sup>, William P. Blair<sup>2</sup>, & Robert A. Fesen<sup>3</sup> <sup>1</sup>Smithsonian Astrophysical Observatory, 60 Garden Street, Cambridge, MA 02138 <sup>2</sup>Department of Physics and Astronomy, Johns Hopkins University, 3400 N. Charles St., Baltimore, MD 21218 <sup>3</sup>Department of Physics and Astronomy, 6127 Wilder Lab, Dartmouth College, Hanover, NH, 03755

abstract

Analysis of 80 ksec *ASCA* and 60 ksec *ROSAT* HRI observations of the face-on spiral galaxy NGC 6946 are presented. The *ASCA* image is the first observation of this galaxy above  $\sim 2$  keV. Diffuse emission may be present in the inner  $\sim 4'$  extending to energies above  $\sim 2$ –3 keV. In the HRI data, fourteen point-like sources are detected, the brightest two being a source very close to the nucleus and a source to the northeast that corresponds to a luminous complex of interacting supernova remnants (SNRs). We detect a point source that lies  $\sim 30''$  west of the SNR complex but with a luminosity  $\sim 1/15$  of the SNR complex. None of the point sources shows evidence of strong variability; weak variability would escape our detection.

The *ASCA* spectrum of the SNR complex shows evidence for an emission line at  $\sim 0.9$  keV which could be either Ne IX at  $\sim 0.915$  keV or a blend of ion stages of Fe L-shell emission if the continuum is fit with a power law. However, a two component, Raymond-Smith thermal spectrum with no lines gives an equally valid continuum fit and may be more physically plausible given the observed spectrum below 3 keV. Adopting this latter model, we derive a density for the SNR complex of  $10$ – $35$  cm $^{-3}$ , consistent with estimates inferred from optical emission line ratios. The complex's extraordinary X-ray luminosity may be related more to the high density of the surrounding medium than to a small but intense interaction region where two of the complex's SNRs are apparently colliding.